Food Handlers in the Army and Their Relationship to Salmonella Food Poisoning*

WILLIAM S. STONE, LT. COLONEL, M.C., F.A.P.H.A.

Office of the Surgeon General, Preventive Medicine Service, Washington, D. C.

THE rôle of the food handler in enteric disease transmission has been extensively studied, but due to the complexity of the factors involved, coupled with inadequate knowledge and means for the detection of dangerous disease carriers, there is a tendency generally to consider them to be of less importance than other factors involved.

In general, this may be true if we consider only the family unit which in normal times constitutes the greater part of the living environment of the world's population. However, the congregation of large elements of the population in armies or cities where other than family contacts predominate in the environmental picture, such as in eating places, places of entertainment, in transportation, places of employment, and schools, presents greater opportunities for disease carriers, and particularly those engaged in food handler rôles, to transmit their infections to non-immunes. These circumstances are always more prevalent during war, disasters, or economic upheavals resulting in mass movements of populations. The present war is no exception--in fact, it is causing a more serious disruption of populations than any experienced in the past. This is due to the ease with which great numbers of individuals can be transported to distant places with transportation means now available, and to the deep penetration of bombing aircraft into areas other than those of actual combat. This results in a greater destruction of the habitations of man and the basic industries that provide for his livelihood. Aside from the destruction of sanitary facilities and equipment, these factors all tend to break up family units and provide dispersion of disease carriers into non-immune populations, thus setting the stage for major disease outbreaks. It is therefore obvious that our civil population and our armed forces will be increasingly exposed to these detrimental influences.

The Army must by necessity gather its personnel from all sections and classes of our populations and must for training and combat purposes bring them together in large numbers. These individuals may be required to serve in any part of the world and will be exposed to whatever diseases are present in the areas concerned. Under these conditions, the food handler carriers of communicable disease will undoubtedly play an important rôle in the prevalence of disease among our troops.

There is plenty of evidence that the Salmonella group of organisms may be

* Presented before the Laboratory Section of the American Public Health Association at the Seventy-first Annual Meeting in St. Louis, Mo., October 27, 1942.

of importance in enteric disease outbreaks that may be encountered. Experience in the Panama Canal Department during 1940 and some of the bacteriological findings in outbreaks encountered to date lend support to this statement. Small outbreaks of food poisoning, diarrhea, and dysentery had been occasionally occurring in various commands in the Panama Canal Department prior to 1940. This led in May of that year to a careful laboratory investigation of the factors involved by the Bacteriology Department of the Board of Health Laboratory, Ancon, Canal Zone, aided by a field investigation conducted by Lt. Col. W. C. Cox, M.C., Assistant Department Surgeon, Panama Canal Department. Twelve food poisoning outbreaks occurred between May and December 31, 1940, and various species of Salmonella were isolated as the etiological agents from the cases occurring in eleven of the outbreaks. There was a direct correlation between the species of Salmonella and Shigella isolated from food handler carriers and the cases of food poisoning occurring in each outbreak. Detection of the carriers and their removal from food handler duty stopped the occurrence of these infections in the commands concerned. It must be pointed out that the food poisoning outbreaks were usually preceded by a few scattered cases, followed by an explosive outbreak — then a continued small incidence of the disease until the food handler carriers were detected and removed from duty, after which no new cases developed.

As a part of the food handler examinations, three stool specimens were collected on alternate days from each individual and cultured for intestinal pathogens. These specimens were delivered to the Board of Health Laboratory within 24 hours of their collection and, for the detection of the Salmonella typhoid groups present, were planted in Selenite F broth, followed by incubation of the broth at 37° C. for 18 to 24 hours. Heavy inoculations of the seeded broth were then made to large Endo plates (150 x 12 mm.) and bent glass rods used for streaking. It was our experience that proper separation of sufficient colonies could not be obtained by using the small Petri dishes. Further, if inhibitive media were used for plating instead of the Endo medium, that colonies picked would frequently not be in pure culture and would require further plating on Endo or E.M.B. medium before carrying out definitive studies.

After plated cultures were incubated overnight, suspicious colonies were picked and inoculated into Kliger's iron medium. Cultures on this medium giving characteristic reactions of the Salmonella or Shigella groups were tested for agglutination in 1–100 dilutions of O and H group specific sera. Those giving specific agglutination were further studied and classified by the use of sugars and morphological examination. Positive cultures roughly classified in the Salmonella group were then forwarded to Dr. P. R. Edwards of the Department of Animal Pathology, University of Kentucky, Lexington, Ky., for definitive species identification, as certain specific H agglutinating sera were not available locally.

Sixty-six hundred and seventeen stool specimens were examined from approximately 2,000 individuals. Of this group, 49 were found to be carriers of intestinal pathogenic bacteria, or an average incidence of 2.45 per cent. Of this group, 40 were carriers of Salmonella other than *Salmonella typhi*, 4 of *Salmonella typhi*, and 5 of Shigella.

The Shigella carriers were made up of 3 positive for the Sonne bacillus, and 2 for the Flexner group of dysentery bacilli. Fourteen species of Salmonella were isolated. The type and number of carriers of each species are given in

Table 1. The findings on all carriers were confirmed by additional cultures after the first isolation. Some of the Salmonella carriers yielded positive cultures over a 60 day period.

TABLE 1

Panama Canal Zone, 1940

Species	*Number of Carriers*
S. paratyphi B	2
S. paratyphi B Var. Java	12
S. typhimurium	5
S. derby	2
S. paratyphi C	2
S. oranienburg	3
S. montevideo	1
S. newport	6
S. typhi	4
S. panama	3
S. give	1
S. anatum	1
S. arechavaleta	1
S. saint paul	1
	44

The distribution of food handler carriers by place and type of personnel is given in Table 2.

negative for gastrointestinal symptoms or a history of food poisoning or diarrhea within 6 months of their detection as carriers. Six of the group gave a history of diarrhea within 3 months' time, but none of them within a period of 1 month prior to the examination. One gave a history of diarrhea 2 years previously and one gave a history of right upper quadrant pain for about 1 month previous to the time of examination.

All positive food handlers were hospitalized and were not allowed to assume their vocation until repeated stool cultures over a 30 day period showed the absence of intestinal pathogens.

SUMMARY

The potential rôle of food handler carriers of Salmonella and Shigella as a possible source of epidemic disease outbreaks during the present war is discussed and the Army experience in the Panama Canal Zone during 1940 with food handler carriers of Salmonella and Shigella presented. Two thousand food handlers were examined—44 were positive for Salmonella, and 5 positive for Shigella; 14 species of Salmonella and 2 species of Shigella were isolated. Positive food handlers were generally asymptomatic and were associated with small epidemic outbreaks of food poisoning and diarrhea.

TABLE 2

Carriers, Salmonella, Found on Stool Examination during 1940, by Place of Duty and Status

Place of Duty	*Military Personnel*	*Civilians*	*Total*
Albrook Field	2	1	3
Fort Amador	3	1	4
Fort Clayton	3	20	23
Post of Corozal	2	0	2
Panama	0	1	1
Camp Paraiso	3	1	4
Quarry Heights	2	1	3
Fort Randolph	0	2	2
Rio Hato	0	1	1
Fort Sherman	1	0	1
Totals	16	28	44

The distribution of the carriers by posts shows a total of 23 for Fort Clayton. A possible explanation of this occurrence was the size of this command and the fact that three fair-sized outbreaks of food poisoning occurred at this post during the period of investigation. The principal organism isolated from cases and carriers at Fort Clayton was *Salmonella paratyphi* B Var. Java.

The medical history of most of the food handler carriers was essentially